631.5
B59c

Vol. XX, No. 5 WASHINGTON May, 1909

THE NATIONAL GEOGRAPHIC MAGAZINE

THE CALL OF THE WEST*

Homes are being made for Millions of People in the Arid West

By C. J. Blanchard

Statistician, U. S. Reclamation Service

THE Call of the West comes to us today insistent and inviting. Formerly it was a Call of the Wild, a voice from out a vast wilderness of mountains, deserts, and plains.

The iron horse has conquered distance and the barriers long interposed by vast spaces of waterless desert have been thrown down. Irrigation canals long enough to girdle the globe with triple bands have spread wide oases of green in the arid places. Cheerful, prosperous communities dot a landscape once vacant and voiceless.

The Great Plains invite the scientific farmer to overcome the lack of rain by intelligent methods of cultivation and wisdom in seed selection.

The unsurveyed and unexplored mountains await the prospector to disclose mineral riches untold. Countless streams rushing downward from snowy summits, unchecked and uncontrolled, lure the engineer to harness and utilize for the needs of commerce the power now wasted. The desert — mysterious, silent, expectant, quivering under cloudless skies—holds a promise of freedom and independence to the careworn and discouraged. It offers the uplift of unmeasured distances and the individual home with that broader freedom of action which comes with life in the open.

May not the influence of its far-flung horizons and its true perspective be potential in character moulding and building? The cradle of our civilization was rocked in the desert. Plato and Socrates dreamed their dreams, imbibed their splendid imagery and stately rhetoric in a rainless land. May not our own desert develop new systems of ethics and morals to lead us back from the material to the spiritual, into ways of gentleness and simple living.

Untouched by plow, unleached by rain, the desert holds fast the accumulated fertility of ages. It awaits the quickening kiss of canal-borne water to yield abundant harvests and to provide homes for millions of our people.

No national work is of more importance today than that of reclaiming for home-builders an empire which in its

* An address to the National Geographic Society, April 2, 1909.

present state is uninhabited and worthless. To those who dwell on the Atlantic slope it seems a far cry to the Great American Desert in which this work is going forward. Our country is of such vast extent, and the desert is so little known, that the average Easterner gives but slight heed to this particular phase of our industrial development, dismissing the subject as of no personal moment. A more careful consideration of all the factors involved in national reclamation makes it apparent that in many essential particulars the creation of a new commonwealth in the arid West possesses features of interest to every manufacturing city in the East. The completion of each engineering work initiates agricultural development. Compact farming communities are quickly established in the zones of irrigation; villages, towns, and cities follow. Railroads extend their branches to the remotest limits of the new country, bringing the commerce of the world to new markets. In a financial way every large manufacturer in the East is interested in the development which is thus promoted. For many years to come the hundreds of thousands of settlers must look to the East for what they wear, for machinery of all kinds, for many of the necessaries and most of the luxuries they require.

HOMES FOR ONE MILLION FAMILIES

Viewed from other than the commercial aspect, the work of reclamation is of national interest, because it will tend in some measure to relieve the overcrowding and congestion of older settled portions of the country. A conservative estimate is that 30,000,000 acres of land will be reclaimed in the arid West. On this basis there will be homes on the land for more than a million families. Each family on the farm will support another family in the urban communities which will rise in these new agricultural districts.

Looking forward to 1950, when our population is likely to be 150,000,000, who can measure the importance of a work which will guarantee homes and employment for ten millions of people, and which will bring into cultivation such a vast food-producing area.

National reclamation gave a wonderful impetus to private enterprise, and astonishing success in the settlement of large areas has followed the efforts of a number of corporations working in conjunction with state governments. There is more activity on the part of individuals in irrigation work today than in any previous time in our history. The development and growth of our arid states and territories during the past five years have been amazing. Land values have steadily risen and the much-desired subdivision of large holdings is increasing with the rise in values. I believe the time will come, and at no distant day, when the big land-owner will be regarded as an undesirable citizen, and laws will be enacted or taxes so assessed as to make it unprofitable to maintain vast estates of which only small portions are productive, and which furnish no employment for the people. To my mind one of the most cheering features of the present growth of the West is this breaking up of the great estates, many of which were taken from the public domain by methods more or less questionable. Here and there are vast tracts of land held in single ownership, or by corporations, which interpose a barrier to the land-hungry and offer obstacles to the proper development of the country.

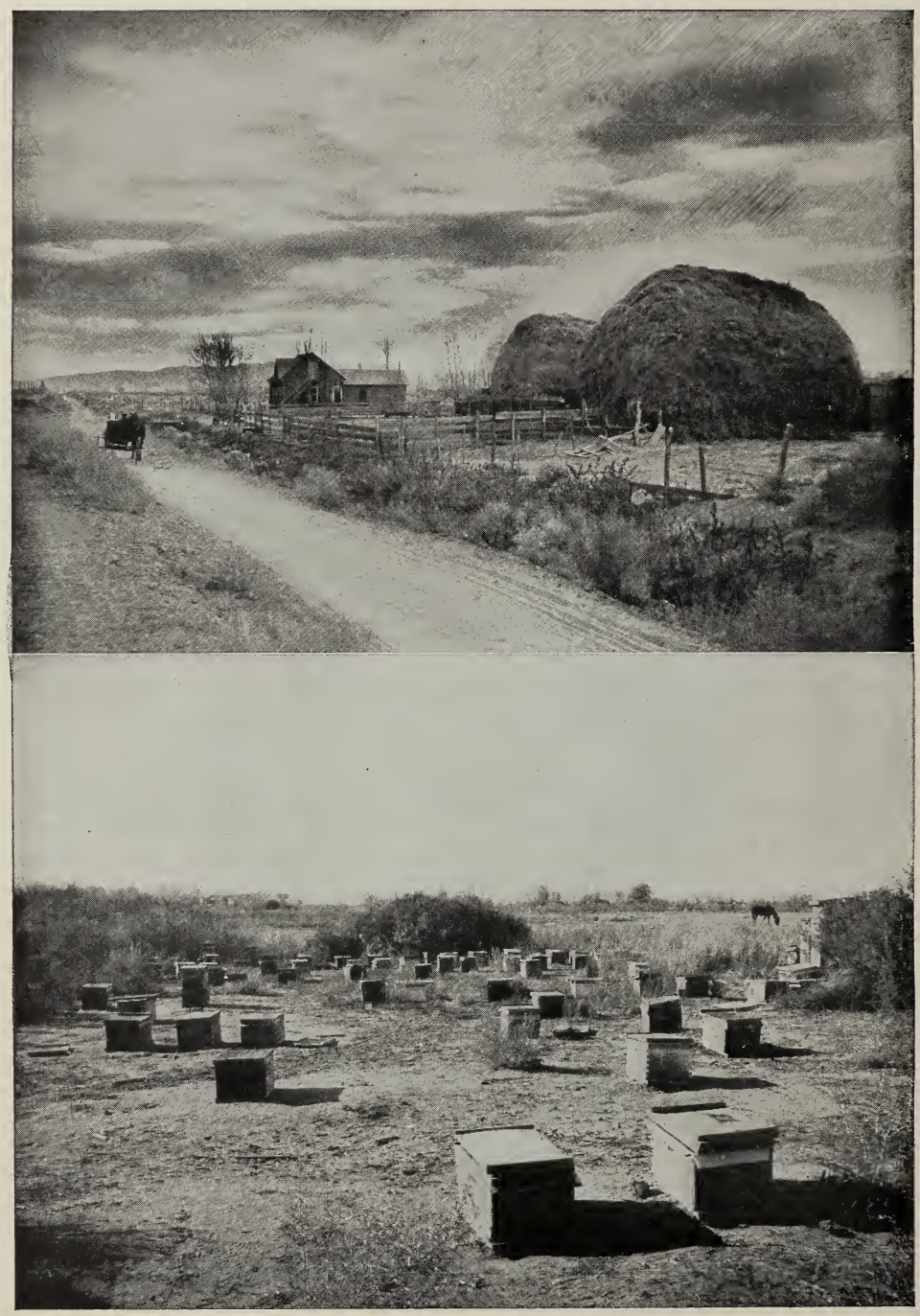
In the main, however, the tendency strongly is to subdivide. The great cattle ranches are being cut up in quarter-section farms, and four homes or more to the square mile dot a landscape which a short time ago held perhaps only a lone ranch house within the radius of vision. Ten years ago I drove for two days across a part of Montana and never saw a spot where the virgin sod had been turned. You cannot drive a mile in any direction in that section today without seeing cultivated land.

THE VERSATILITY OF THE WEST

Versatility is not confined to any one locality in the West. In the majesty and

BUILDING A HOMESTEAD OF CONCRETE BLOCKS ON THE TRUCKEE-CARSON IRRIGATION PROJECT, NEVADA (SEE PAGE 427)

TYPE OF THE CENTRALIZED GRADED SCHOOLS ON THE HUNTLEY PROJECT, MONTANA
Two years ago there was not an inhabitant within miles of this school-house (see page 408)



A TWO-YEAR-OLD HOMESTEAD ON THE TRUCKEE-CARSON PROJECT, NEVADA

200 COLONIES OF BEES ON THE SAME PROJECT (SEE PAGE 427)

grandeur of its mountains, lifting their heads into regions of perpetual snow; in forests whose age antedates the birth of the Savior; in canyons whose picturesque carving consumed centuries upon centuries of time; in landscapes and scenery of such beauty and color as were never shown on canvas; in deserts where life is still elemental and primitive, and where amid the crumbling ruins of departed races strange people dwell in an atmosphere of dreams and enchantment, and with mythology and legends as interesting as those of ancient Greece; in all that Nature has ever done to enthrall the senses, to inspire the tongue or pen, the West suffers not by comparison with any part of the Old World. We show but faint regard for all the wonders Nature has lavished on our country when so few of us ever seek to enjoy them. A few of the millions spent annually by Americans in foreign lands, if expended at home, would make easy of access and enjoyment for thousands of our people many of the splendid attractions of our own country.

The man from the West sojourning for a time in the East, if he gives free expression to the pride he rightly feels in his native heath, is likely to be regarded as an apostle of discontent by those who listen. Lucky for him if he does not achieve the reputation for veracity given to an old fellow in the middle West.

The oldest inhabitant and the man who remembered the weather for fifty years back were seated about the stove in the corner grocery one winter's night discussing the veracity of old Si Perkins. Uncle Bill Simpkins strolled in and took his place near the box of soda-crackers.

"Say, Uncle Bill," they asked him, "would you call Si Perkins a liar?"

"Wall," said Uncle Bill, thoughtfully, as he spat in the stove, "I don't know as I'd go so fur as to call him a liar exactly, leastways not just plain every-day liar, but I do know this much: when feedin' time comes, in order to git any response from his hawgs, he has to git somebody else to call 'em fer him."

It is with no wish to encourage unrest and dissatisfaction with your present invironment that I am here tonight. I come rather as a messenger from a far-off and little-known part of our country, bringing a story of progress and achievement. It is a story in part of kinfolks of ours whose hearts are fired with the same courage, patriotism, and fortitude which enabled our ancestors to wrest a commonwealth from the New England wilderness. They are imbued with high ideals and noble purposes, and by their achievements are establishing us more firmly in our place among the greatest nations of the earth.

THE MIRACLE OF IRRIGATION

The miracle of irrigation, which is performed each year in the arid West, is a most impressive and wonderful manifestation of Nature's beneficence to man.

Throughout the winter season the clouds of heaven are swept hither and thither about the uplifted mountains, whose heads tower a mile above the plain. On their frowning fronts and lofty summits the snows fall heavily, covering deeply every peak and promontory and filling every chasm; then the warm rays of spring and summer sun fall softly upon the white snow-banks and tiny streams, and roaring cataracts burst forth and journey downward to fill to overflowing numerous lakes, each a sapphire gem in the heart of the mountains.

The heavy clouds and towering peaks, the falling snow and gentle sunshine, the rush and whirl of descending waters, these are recurring evidences of nature's maternal contributions to the dweller in the desert.

It remains but for man's industry and intelligence to utilize these generous donations. The engineer finds no field more attractive than this for his energies. He curbs the stream with masonry dams and lifts the water into huge canals. Water and land long divorced are wedded, and wavering fields of grain and orchards prolific beyond comparison replace the wastes of sand and sage-brush.

On three previous occasions I have had the privilege of taking the members of this Society, with the aid of the stereopticon, to view some of the wonders of our Far West, and have shown them some of the work of the government's engineers.* We have looked upon the towering structures of granite and concrete, slowly rising to block abysmal canyons; we have in fancy traveled over highways carved from beetling cliffs and traversing waterless deserts; we have seen the surface of the valleys gashed deeply by broad canals carrying whole rivers to fructify a thirsty land. Tonight, while I shall show you more of these creations of daring engineers, it is also my chief aim to make you more fully acquainted with the real purpose of these great works—the making of homes. One of the best examples of the wisdom of the national irrigation law is afforded by the Huntley project, in Montana.

THE HUNTLEY PROJECT, MONTANA

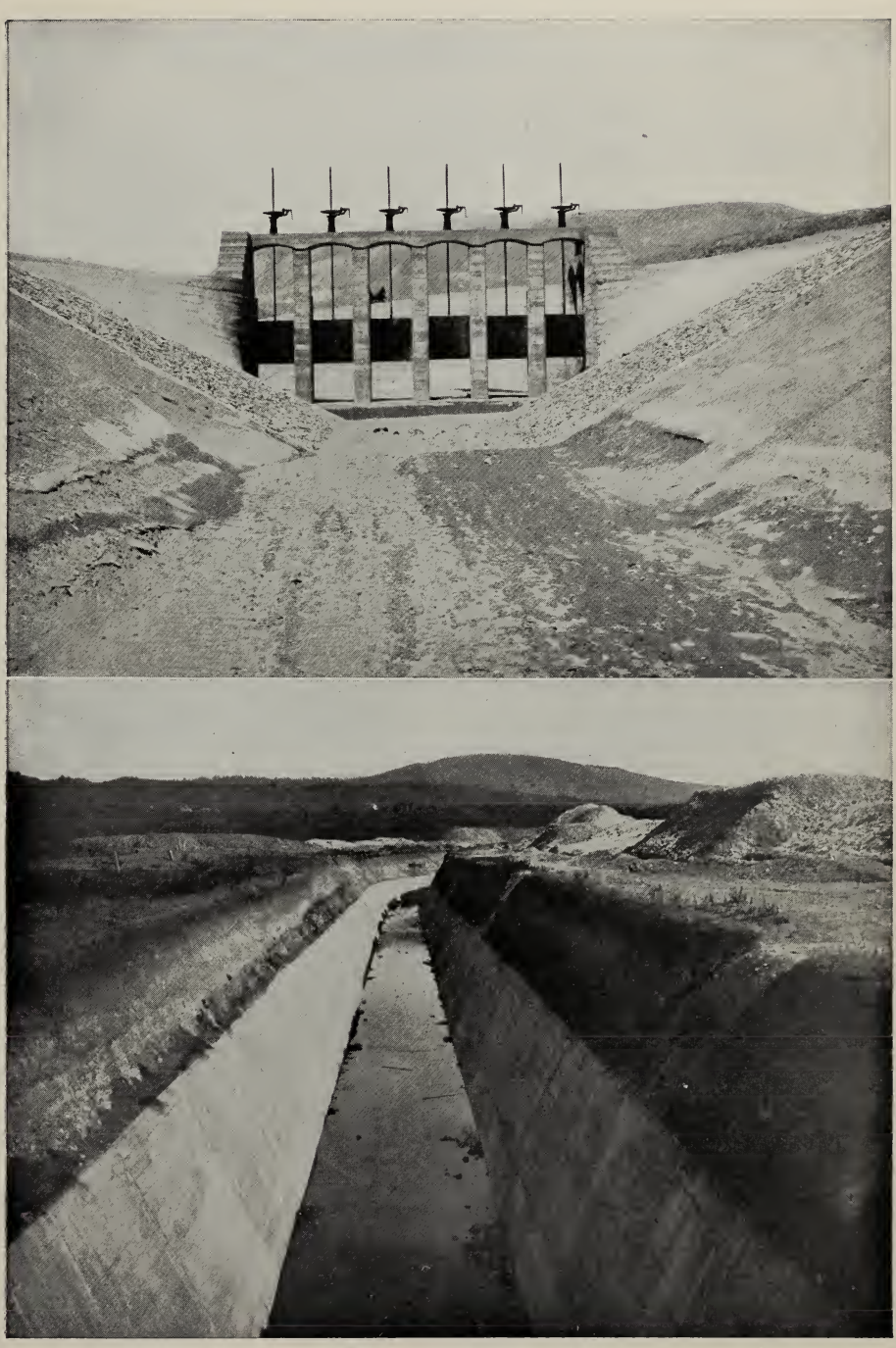
On July 17, 1907, about 30,000 acres of land were thrown open to settlement upon the completion of the irrigation works. This fine tract of land in the valley of the Yellowstone was absolutely virgin; a plow had never scratched its surface. It lay there as nature made it, storing for ages the elements required for plant life. Lacking in rainfall, it produced nothing but sage-brush and bunch grass. To make up for the oversight of nature, a million dollars were expended on irrigation structures and canals. Three hundred families, from all parts of the United States, established themselves upon the 40-acre farms and began at once to erect their simple homes, to clear away the sage-brush, and prepare the lands for crops. To most of them irrigation was an unknown science, to many farming was a new experience. With the cheerful optimism and abiding faith which somehow seem to characterize the dweller in the desert, they set themselves to their several tasks. It was a backward season, a cold, late spring, yet nevertheless every man who sowed reaped some measure of harvest, and in many instances the rewards were beyond reasonable expectation. It is remarkable, but true, that notwithstanding lack of knowledge, unpreparedness of the land, and unfavorable season, not one total failure is recorded; nor has a single individual uttered complaint to the Reclamation Service.

Especially interesting to me are the experiences of those who came to this new country without any previous knowledge of farming. Their successes may well lead us to believe that new avenues of hope are opening to the careworn and discouraged who are living miserably in our crowded cities.

THE MAKING OF PROSPEROUS HOMES

A few years ago a young man, raised on a Pennsylvania farm, came to Washington, D. C., and was enrolled as a stenographer in the Post Office Department. About three years ago he took stock, as it were, and decided that a clerical profession did not suit him. He concluded to improve his annual leave by taking a western trip, and stopped off at Billings, Montana. He was attracted strongly by this progressive young city, and decided to remain. When the Huntley lands were opened, and he took a chance, fortune favored him and he drew a farm of 47 acres, all irrigable. A part of the $1,500, which represented his savings as a government clerk, he paid out at once for the erection of a neat cottage; the sum of $176 was paid for his first installment of water right. A year ago last month the home was ready, and after resigning his job he sent for his family and moved in. He cleared 35 acres of sage-brush, plowed and leveled it, and sowed 24 acres to oats and 4 acres to wheat. He set out 250 apple trees, and between the rows planted 4,000 strawberry plants, potatoes, currants, grapes, strawberries, and blackberries. About the house he set out quick-growing cottonwoods and many junipers. The housewife, meanwhile, did not forget a small flower garden, nor neglect a lot of

* See "Winning the West," February, 1906; "Millions for Moisture," April, 1907; "Homemaking by the Government," April, 1908, NAT. GEOG. MAG.



GATES IN THE MAIN CANAL OF THE TRUCKEE-CARSON PROJECT, NEVADA
(SEE PAGE 427)

A PORTION OF THE CONCRETE-LINED MAIN CANAL OF THE KLAMATH PROJECT, OREGON (SEE PAGE 417)

BUILDING THE HIGHEST MASONRY DAM IN THE WORLD: SHOSHONE DAM, WYOMING

The dam will be of concrete gravity type, 328.4 feet from bed-rock to top of parapet walls; 85 feet long on the bottom; 200 feet long on the top; 108 feet thick on the bottom. It will create a reservoir covering 6,600 acres, with a capacity of 456,000 acre-feet. Water will be used to irrigate about 150,000 acres of land lying 75 miles east of the Yellowstone National Park (see page 411).

fancy chickens. On the first of November he took an inventory for me and reported oats yielding 62 bushels and wheat 30 bushels per acre. Potatoes and other vegetables proved a good crop and furnished enough to carry him through the winter. The apple trees are flourishing, and the outlook for small fruit is most encouraging for 1909. This spring he will plant 30 acres in sugar beets, and he says he can net from $50 to $80 per acre.

Growing tired of the dangerous profession of locomotive engineer, Elmer Eiker resigned and took up a farm at Huntley, where he moved his family, consisting of a wife and three daughters. His capital was about $1,000. He only cleared and cultivated 20 acres, planting an assortment of wheat, oats, sweet corn, potatoes, onions, squash, sugar beets, watermelons, cantaloupes, and other vegetables. It was such a variety that I accused him of making a raid on some Congressman's seed appropriation. Rather remarkable to relate, he was successful with nearly everything he put in the ground. His oats threshed over 45 bushels; wheat, late planted, 18 bushels; potatoes, 150 bushels; onions, 300 bushels per acre; from one-eighth of an acre in cucumbers he sold more than $50 worth. Everything was grown on new land never before touched by a plow. Mr Eiker says any man with three horses, a cow, a few chickens, and $500 in cash, combined with industry and common sense, can make good on one of these 40-acre farms. Several hundred farmers, his neighbors, are doing it. The Huntley project now contains 300 new homes. Its towns are growing. There are eight graded or centralized country schools, four church organizations, and a bank with $50,000 in deposits. Two years ago this country was a sage-brush desert and uninhabited. Last year the first crop was irrigated by water from the new canal system.

THE SHOSHONE PROJECT, WYOMING

Under the protecting shadows of a lofty mountain range in northern Wyoming there is a broad and fertile valley through which flows a strange and wonderful river. In prehistoric days immense geysers along the stream sent their boiling waters high into the air. In the river bed and on the banks great hot springs burst forth, the waters possessing qualities of healing and odors far-reaching. The Indians, who oft renewed their youth in them, called the stream Shoshone, or "stinking water"—an unfair cognomen—for, save at the spring, the river is as clear as a mountain brook and its waters are good to drink.

Unnumbered ages ago there was a beautiful lake, a few miles above the valley, fed by countless streams flowing down from snowy peaks. Between it and the valley a range of lofty mountains intervened. When the lake topped its banks the overflow, passing through some cleft or crevice in the mountain range, during centuries of time gradually chiseled out a canyon eight miles long and hundreds of feet in depth. When the bottom of the canyon was cut below that of the lake, its waters poured out and passed through the gorge and the lake bed was exposed. The entrance of that gorge is only 60 feet wide on the bottom; 300 feet above it is only 200 feet wide. No irrigation engineer could view it without wishing to lock it with a dam. It has been waiting all these years for some one daring enough and with capital enough to block it up and restore once more the beautiful lake that disappeared so long ago.

A BLOCK OF CONCRETE SEVERAL HUNDRED FEET HIGH

In 1910 the lake will reappear, and on its shores countless wild fowl will build their nests. From the depths of the shadowy canyon the world's highest masonry dam is slowly rising, a solid block of concrete, locking securely the perpendicular cliffs of granite and thrusting back the angry floods of the turbulent and torrential river. The work is impressive; it is also attended by many dangers and calls for courage and daring on the part of the men engaged upon it. The scenery is magnificent, the canyon justly ranking with other famous gorges

of the West. The drive over the highway constructed by the Service is one never to be forgotten. As the future route to a new entrance to Yellowstone Park, it will doubtless attract thousands of tourists. The great dam is for storage and for power development. It will hold back flood waters heretofore wasted until needed for irrigation in the summer.

Down the river another dam, a low structure of concrete, diverts the stream into a tunnel 3¼ miles long. This tunnel, passing through the bluffs on the river's edge, emerges at the head of the valley and the waters are carried into a broad canal and thence to the farm lands. Last spring an opening occurred here and 17,000 acres were offered to settlers. Practically all of the farms are taken and many of the newcomers have harvested a crop already. In all my experience in the West I do not recall a more rapid transformation from brown desert to green fields than I saw here last summer. The swiftness with which things grew on this desert soil was positively startling. More than 100 families are now established here and, as on the Huntley, there are no complaints. A second unit of this project, consisting of 13,000 acres, will be made ready for settlers in time for spring planting. At the same time a portion of the lots in the government townsite of Powell will be sold at auction, affording many opportunities for merchants, mechanics, and men of other professions. "The best country I ever lived in" is a common expression on this project.

SUN RIVER PROJECT, MONTANA

To the man who is accustomed to the climate of New England or our Northern States, the attractions and advantages of the Sun River country, near Great Falls, Montana, should appeal strongly. Especially is this true if he be inclined to engage in general farming and raising live stock. The farms on this project are 80 acres of irrigable land, for which the settler must pay for water at the rate of $30 per acre, payable in annual installments, not to exceed ten, without interest. He is also allowed to file on 80 acres of non-irrigable land, for which he pays only the usual filing fee—about $16. The unirrigated land can be utilized for pasture, corrals, and buildings. Back of the irrigated lands is a vast area of free range covered with nutritious grass in the summer and furnishing forage for vast flocks and herds which in the winter consume the crops grown by irrigation. Owing to the fact that the project is at present some miles from a railroad, settlement has been slower here than elsewhere. The time is not far distant when a new railroad will be extended into the valley, and it is expected that settlement will then be more rapid.

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA

A short time ago the Lower Yellowstone project, embracing 66,000 acres in Montana-North Dakota, was formally opened. A large part of the land is already filed upon. Owing to the very favorable season, many settlers raised good crops of grain last year without irrigation. As a rule they have all prospered, and the outlook for this section of the Yellowstone Valley may be regarded as propitious.

Among the first settlers on the government land on this project was a tall, rawboned young man, a wood-polisher from Buffalo, New York, who filed on 160 acres near Sidney. He landed with exactly $50 in his pocket. Securing employment as a teamster, he saved his salary until he bought a team and wagon of his own, and then secured a contract for hauling supplies. He has now nine good horses and two wagons. On his farm he has erected a good house, has fenced his land, and will henceforth devote his time to harvesting bountiful crops. He has done all this within three years.

OTHER MONTANA PROJECTS

Montana, owing to its very large areas of public domain and its splendid water supply, is a most inviting field for the engineer. The early opening of three

RELICS OF OLD ARIZONA: THE APACHE AND THE CACTUS (SEE PAGE 426)

LOWER PORTAL CORBETT TUNNEL: SHOSHONE PROJECT, WYOMING

This tunnel is 3¼ miles in length, has a cross-section of 10 x 10, and a capacity of 450,000 gallons per minute

Indian reservations will make available for development a hundred thousand acres of choice land in the future.

On the Milk River project, in this state, the government is at work on a large dam at Dodson, while the farmers themselves have undertaken and are successfully building the largest irrigation canal in the United States. On the Saint Marys project, the water supply of which has been made the subject of a treaty not yet ratified, the work of canal building is being done largely by Indian labor. The Indians will be employed to build their own ditches on the Flathead and Fort Peck reservations as soon as plans are decided upon.

Preliminary surveys have been made on this project and an irrigation system designed to supply 130,000 acres of land on the Flathead Indian reservation, in Flathead, Sanders, and Missoula counties. Work will be carried on during the season of 1909 on four units—the Jocko unit covering 6,000 acres; the Mission, 4,500 acres; the Polson, 3,000, and the Mud Creek, 6,000 acres. The Indian allotments amount to 80 acres of irrigable land for each individual. The lands remaining after all the allotments are made will be opened to the public after due notice has been given by the Secretary of the Interior through the public press.

The lands lie about 2,800 feet above sea level, and the temperature ranges from 20° below to 100° above zero. The soil is clay, forest loam, and gravelly loam, and the products are alfalfa, grain, vegetables, apples, and small fruits. The project is located between the Great Northern and the Northern Pacific railroads.

THE NATIONAL IRRIGATION PROJECTS OF WASHINGTON

In the minds of most Easterners the northwest boundaries of our country are usually associated with blizzards and a temperature that puts the average thermometer out of business. There are places along the border where the winds blow and 50 degrees below zero is not uncommon. Again there are places where the seasons are so genial, the temperature so favorable, that delicate fruits like apricots and peaches are grown successfully. Close to the Canadian line, in Washington, is a remarkable valley, shut in by sheltering hills and mountains and favored with the kindly Chinook winds. It is known as the Okanogan Valley, sometimes called the California of the Northwest.

It richly deserves the name, for it is the boast of its early settlers that no killing frost has ever destroyed the orchards in that valley. The reclamation project here is the most expensive per acre of any of those now in process of construction. So abundant are the yields and so profitable and varied are the crops that the land-owners very cheerfully entered into a contract with the government to pay a charge of $65 per acre for a water right. The assurance of a constant and sufficient supply of water for irrigation has increased land values tremendously. Prices here to the Easterner seem very high until the earning capacity of the lands is demonstrated. The Okanogan Valley sent an exhibit of fruits to the Industrial Fair at Spokane last fall. Out of 23 plate exhibits the county drew 19 prizes.

Eight years ago James O'Herin, a shrewd Yankee from Portland, Maine, came to the valley seeking a home. He had $500, and filed upon a homestead which he commuted, and in 1905 sold it for $10,000. This sum he immediately invested in another ranch, which in three years' time he has so improved as to be worth more than $20,000. From a tenant farmer in the East to a land-owner worth $20,000 in eight years may be taken to indicate the possibilities which await the industrious and intelligent home-seeker in the arid West.

IN THE VALE OF PLENTY

Southward and near the line dividing Oregon and Washington is the great Yakima Valley, beyond question the most widely advertised and best known agricultural region in the Northwest. It is

Washington's vale of plenty. The fame of its prodigious crops, the excellence of its fruits, and the general prosperity of all of its people are subjects of fascinating interest. The valley may be said to have been absorbed by the Service, which in the interest of economy has acquired the principal irrigation system and controls the entire flood flow of the stream. The plans provide for a gradual and comprehensive development of several hundred thousand acres of land of unequaled richness. The work is now centered upon two units—the Tieton and Sunnyside—but in the near future the Wapato unit, embracing the Yakima Indian lands, will be opened to settlement.

At the risk of losing my reputation for veracity I wish to mention a few of the numerous instances of success on the part of horticulturists in that valley.

J. O. Shadbolt, for ten years a dry-goods merchant of Virginia, Minnesota, came to Wapato, Washington, in February, 1906, and bought 41 acres, all in bearing orchard, including apples, peaches, pears, plums, apricots, and cherries. He paid $18,500 for the place, or a little over $450 per acre, a price which his friends declared was evidence that he was crazy. He added $2,500 for improvements, making an initial investment of $21,000. In 1908 Mr Shadbolt refused a definite offer of $50,000 for his ranch. Let us briefly analyze the crops produced in the three years he has owned the ranch. In 1906 his sales were as follows:

6,933 boxes Bartlett pears	$6,612.00
2,652 boxes Crawford peaches	1,326.00
8,743 boxes Elbuta peaches	5,245.80
Over-ripe pears sold at home	250.00
4,243 boxes plums, apples, apricots, and cherries	3,023.72
Total	$16,457.52

Deducting operating expenses, about 25 per cent, left a net profit of $12,000.

In 1907 the orchard yielded gross, $29,485.47, and net, $20,500.

In 1908 the business depression affected the market and prices were lower; nevertheless the orchard netted $7,500. In the three years former shopkeeper Shadbolt, who never before had any knowledge of fruit-raising or irrigation, has netted $39,500 on an investment of $21,000, or an average of $13,166 annually. His net income each year has exceeded 62 per cent on his investment. His annual net returns averaged over $321.13 per acre.

Edgar Silvers, from an unirrigated farm near Albion, Nebraska, came to Toppenish six years ago and bought a ten-acre farm under the government canal. He has now 7½ acres in bearing orchard and 2½ acres in young trees. From his matured trees last year and from the vegetables and clover grown between the rows he received $2,727.60 gross. He says this beats 160 acres in the corn belt in net yields, besides being a lot less worry and hard work.

From 9 acres of apples, or 660 trees, A. Larson, of Zillah Post Office, a former citizen of Stockton, Wisconsin, sold $3,755 worth in 1908.

L. I. Barbee, a former resident of Red Oak, Iowa, now living on a 20-acre ranch at Toppenish, sold $2,341.60 worth of apples, pears, plums, and prunes from 357 trees, or more than $6.50 per tree. These trees occupy 6½ acres.

J. C. Milton, also from Red Oak, Iowa, now owner of 6 1-3 acres in apples and peaches, harvested from 300 trees $2,578.55 worth of fruit in 1908, or nearly $8.60 per tree. His average gross return was $407.14 per acre.

Robert McCormick, formerly a lumber-jack at Blue Earth, Minnesota, landed in Zillah ten years ago with just 75 cents in his pocket. For two years he worked as laborer and teamster, and then with his savings made the first payment on 25 acres under the government's canal. It was raw land then, covered with sagebrush. Today it is all in cultivation, and his little farm is bringing him in each year $2,000 above all expenses. Last year he picked 780 boxes of apples from 1¼ acres. He has refused $1.25 per box, or $975 for his crops, which indicates a yield of $780 per acre.

COMMUNAL FARM LIFE IN OREGON

Between the Umatilla River on the west and the Columbia River on the north, in northwestern Oregon, is a broad expanse of sage-brush desert which is now undergoing a remarkable transformation. The irrigation works of the government here consist of a diversion dam in the Umatilla River a few miles above the town of Echo and a storage feed canal, 20 miles in length, carrying the flood flow of the stream into a large reservoir, having a surface area of 1,700 acres and a depth of 70 feet. From the reservoir a series of canals have been extended to embrace about 20,000 acres of exceedingly fine land. The productivity of this section has long been known through the profitable crops under small private ditches. Agricultural experts all agree that this valley has a most promising future. At no distant day we may confidently look for one of the most compact agricultural districts in the state to be established here. The soil is of great depth, the summer comes early, and the growing season is longer than in most parts of the West. The truck and fruit grower can place his crops on the markets in advance of his competitors, and be sure of top prices in the markets of Spokane, Seattle, Tacoma, and Portland, all of which are tributary by rail or water transportation.

An interesting phase of the development here is the combination of urban and rural life; farms are small; many five and ten-acre orchard tracts are being laid out about the towns, and the owners of many of these have built their homes in the towns, so that their wives and children have the advantages of society, schools, and churches.

THE KLAMATH PROJECT

In the land of "Burnt Out Fires"—the region which will long be remembered as the last stronghold of the Modoc Indians—is a remarkable agricultural district known as the Klamath Basin, which lies partly in California and partly in Oregon, and embraces several hundred thousand acres. The first unit of this important national irrigation work is completed, and several thousand acres of fertile land are now receiving water from the government canals. Of all the Federal works, Klamath project is, perhaps, the most unique, by reason of the fact that it involves irrigation and drainage in unusual combination. A considerable portion of the lands to be irrigated is today covered with the waters of navigable lakes; these waters are to be drawn off and the exposed lake beds are then to be subdivided into farms and irrigated by the government canals.

A new railroad has been completed to the valley, and the indications are that this region is to enjoy rapid growth and development. Its advantages in soil, climate, and products, as well as in great undeveloped natural resources—in forests, water power, and free grazing—are certain to attract enterprising citizens from all parts of the country.

IDAHO'S WONDERFUL DEVELOPMENT

The most important stream in the arid West is Snake River, in Idaho. From the foothills of the Tetons, which form the boundaries of Wyoming and Idaho, to the western boundary of the latter state, Snake River traverses a wide lava plain which constitutes the most interesting and important physiographic feature of the southern part of the state. Snake River now irrigates a larger area than any other stream in the United States. Two reclamation projects of the government have been undertaken in this drainage basin, one supplied from the main stream and the other from two important tributaries.

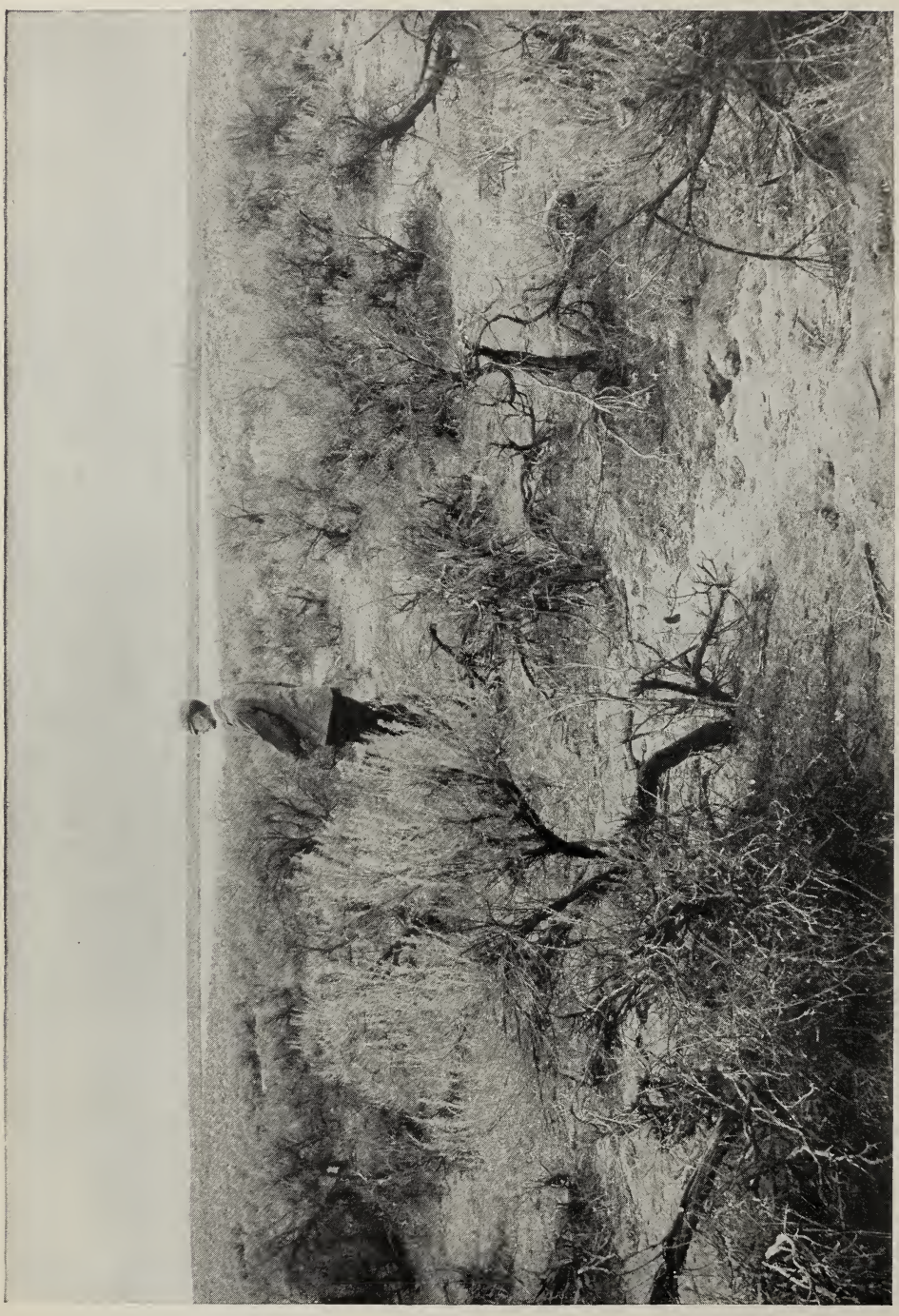
The Minidoka project, in the southern part of the state, was partly completed in 1907, and made available for entry 1,050 farms, varying from 40 to 80 acres each. Before the water was ready every farm was filed upon, and 5,000 people established homes in the sage-brush. The most important feature of construction is the rock-fill dam across the river, a structure 650 feet long on top and 50

THE PATHFINDER DAM OF THE NORTH PLATTE PROJECT (SEE PAGE 427)

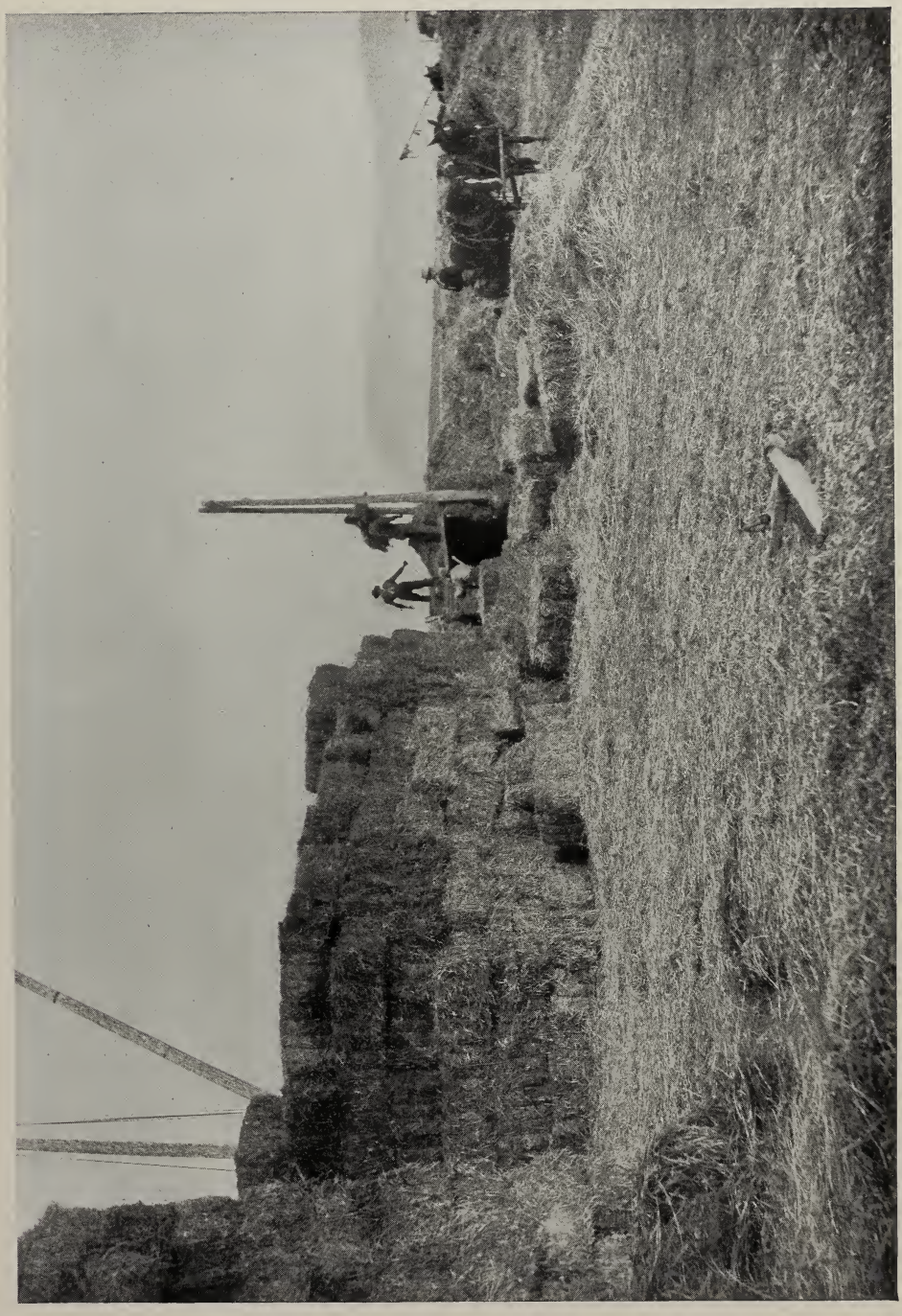
This structure will be 215 feet high and will create an enormous reservoir, with a storage capacity of 1,025,000 acre-feet, or enough water to cover 1,025,000 acres a foot deep. It will be completed May 1, 1909, and will cost $975,000

CLOSING COLORADO RIVER DURING CONSTRUCTION OF LAGUNA DAM, YUMA PROJECT, ARIZONA-CALIFORNIA

Nearly 72,000 cubic yards of material were dumped into the stream before the closure was effected. The Laguna dam now completed is 4,780 feet long, 19 feet high, and weighs 600,000 tons



A STRETCH OF SAGE-BRUSH DESERT BEFORE IT WAS LAID OUT IN FIVE-ACRE TRACTS FOR CULTIVATION: UMATILLA PROJECT, OREGON (SEE PAGE 417)



BALING HAY IN OREGON ON THE FORMER SAGE-BRUSH DESERT

feet high. On each side large canals take the water out upon 130,000 acres of desert land. This section of Idaho has been widely advertised, and contains several of the largest irrigation enterprises ever built by private capital. What was astually an uninhabited sage-brush plain in 1902 now contains probably more than 20,000 people, and its development has only just begun. If the storage supply proves adequate, not less than a million acres of exceptionally fine land will be brought under cultivation, and this one section will then support a population equal to that of the entire state.

Nearly 400,000 acres of fertile land in the valleys of the Payette and Boise rivers, in southwestern Idaho, are embraced in a reclamation project. This is a most attractive region and practically all of the public lands have been taken up. With its advantages of soil, climate, and crops, these valleys will support in comfort a large population. The progress made here in the last three years presages nearly ideal conditions of rural life. Trolley lines and telephones now connect many of the farms with the growing cities. It is possible even now to live in the country 25 miles from the city and enjoy many of the advantages of the latter. On February 22 of this year the people of the valley formally celebrated the opening of the first important unit of this work. In the presence of several thousand people the gates of the big Boise dam were closed and the waters turned into a huge canal. The Boise dam is 400 feet long on top and 45 feet in height. An important feature of this project is the Deerflat reservoir, whiich was created by building two very large earthen dams inclosing a depression between the hills. One of these dams is 4,000 feet long and 70 feet high; the other 7,200 feet long and 40 feet high. The total quantity of earth and gravel in these dams is 1,088,800 cubic yards. The main canals in this project will have a total length of 400 miles.

IN PROSPEROUS COLORADO

In Colorado, one of the pioneer states in irrigation, the government has nearly completed one large project and is preparing to begin work upon another. The first of these is kown as the Uncompahgre and is located in the western part of the state. In the valley of the Uncompahgre are many thousands of acres of fertile land, easy of access for irrigation canals, wanting only the application of water to produce abundant and valuable crops. Unfortunately this stream is deficient in flow and erratic in regimen. The canal systems in use were often short of water, and crops and valuable orchards frequently suffered from drouth. At a distance sufficiently near to be tantalizing flows the Gunnison with an unfailing supply, little of which can be used in its own valley. The two rivers flow in nearly parallel courses for many miles, separated by ranges of rugged hills 2,000 feet high, forming some of the roughest country in the West. The problem of uniting the waters of these two rivers was often discussed by engineers, but practical plans were never formulated until a daring engineer of the Service, at the peril of his life, made the necessary preliminary surveys.

For many miles in its course the Gunnison rushes through a box canyon, with walls in places 3,000 feet high. A portion of this profound gorge had never been explored until the government engineer accomplished the feat. The preliminary survey, which was made during that wild trip down the river, showed that the elevation of the Gunnison was higher than that of the Uncompahgre, and proved the feasibility of transferring some of the waters of that stream by means of a tunnel passing under the mountain. It was a stupendous task, involving an enormous outlay of money and taxing engineering skill and ingenuity to the limit. The work of final survey and location was most perilous, owing to the necessity of making a topographic map of the canyon and estab-

lishing precise levels at both ends of the tunnel. Before construction could be begun a road was built into the canyon so that heavy machinery could be brought in. A town sprang up at the bottom of the rock-walled chasm, a power plant was erected, and after many months of weary labor the drills began to eat into the granite. On the other side of the mountain another town was established and similar work commenced.

The total length of the tunnel will be nearly six miles, of which five and a half miles are now completed. Throughout the entire period of construction the work has been attended with difficulty and danger; gas, cave-ins, and subterranean springs of hot and cold water have interposed obstacles, delaying the work and requiring the utmost care in its prosecution.

The Uncompahgre Valley has been getting ready for the coming of this new water supply in 1910, which will make fruitful 150,000 acres of desert, and which will ultimately become one of the rich agricultural and horticultural districts of this continent.

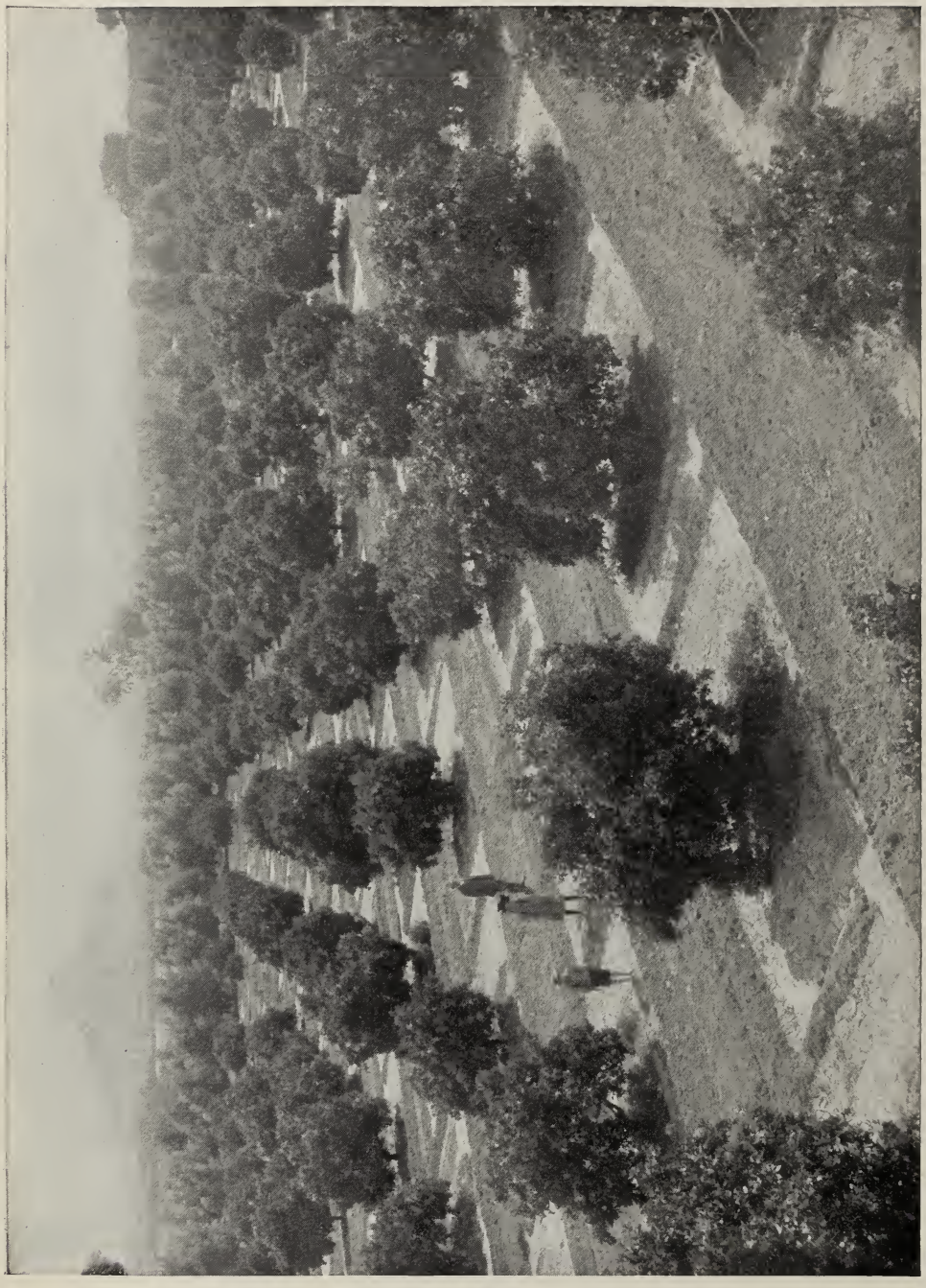
Colorado's second reclamation project is located in the vicinity of Grand Junction and embraces some 50,000 acres of the best land in the famous Grand Valley—one of the most favorably situated agricultural valleys in the world. This is a region where scientific fruit-growing is the rule and not the exception, and as a result of the enterprise and intelligence of its farmers fruit lands here have a higher value than anywhere else on the globe. The climate, soil, and elevation are alike adapted to the growing of a variety of products which in perfection, color, and flavor are unexcelled. It requires no particular gift of prophecy to foretell that when the works are completed this valley will become one of the nation's show places. The farms will be small in area, making the settlements compact; intensive agriculture will be extended, and large areas in high-priced fruits will be cultivated. With cheap water power right at hand, trolley lines will be extended to all parts of the valley, affording facilities for cheap and ready marketing of all products. There is no reason why farm life will not ultimately become more nearly suburban than rural in character.

The opportunities which exist here for making a farmer's life attractive will not be overlooked. We may confidently look for a citified country. Constant contact and association with his neighbors will bring about coöperation among the farmers both in producing and marketing the farm products.

This is not a picture of fancy; it is not a dream of Utopia; rather is it the inevitable result of intensive and scientific cultivation of small farms, each occupied by its owner and family.

THE COLORADO RIVER AND ITS PROBLEMS

The Colorado River, its watershed and its wonderful delta, have long been subjects of engrossing interest to the engineers of the West. The desert of this river is a distinctive feature in a region full of natural wonders. A large portion of it lies below sea level, and in recent geologic period was the bed of the ocean. From earliest time this great stream, rising in the mountain fastnesses of distant Wyoming, Colorado, and Utah, has been carving out a canyon through an elevated plateau more than a mile deep in places and unrivaled anywhere in the world in scenic grandeur. During countless ages the Colorado has been grinding to powder incalculable quantities of rock and soil, building up a broad valley with sedimentary deposits, and elevating its bed above the level of the desert through which it flows. As a whole, the Colorado River probably offers the most interesting as well as the most stupendous engineering problem which exists in arid America today. Solve it successfully, and a million acres of desert in this country and half a million acres in Mexico will furnish homes for more than a million people. No power save that of the Federal government can cope successfully with this problem. Mexico will doubtless be willing to share her proportionate part in the expense of storage



IRRIGATED ORANGE GROVES IN THE SALT RIVER VALLEY, NEAR PHOENIX, ARIZONA (SEE PAGE 425)

for water to be utilized on lands belonging to that Republic. The problem involves interstate as well as international features, and will require the expenditure of a sum of money great enough to make the work comparable with the largest schemes for irrigation attempted by England in Egypt or India. From its headwaters in Utah, Wyoming, Colorado, and Arizona to the rainless delta, the river must be absolutely controlled. Enormous reservoirs must be created by building dams in the mountain regions to store the floods, and hundreds of miles of canals must be laid out to carry the water upon a sleeping empire.

The Colorado desert is a region unique and wonderful. Potentially, it is greater than any area of its size in the world. The fertility of its soil, its climatic adaptability to unusual crops as well as many staples, make it one of absorbing interest to the agricultural scientists. The first important step has been taken by our government for the subjugation of the Colorado. A few weeks ago the engineers of the Service, after two years of difficult labor, succeeded in placing a dam across this intractable river. As if resentful of any attempt to check it in its mad course to the Gulf, the Colorado rose in flood to oppose the engineers. The final struggle was of many hours' duration and full of excitement and danger to an army of men who fought bravely for hours against the rising wall of angry waters. The coffer-dams held fast and the Colorado was safely turned at last into the enormous sluiceways on either side. Today a solid wall of stone and concrete 4,780 feet long and 250 feet wide, tied to enduring hills of rock on either end, rests in the channel. Man has again conquered the forces of nature, and a mighty river, never before controlled, is now a servant to his hand. During the present summer 17,000 acres will be opened to settlers on this project, the lands lying in California.

IN AMERICA'S EGYPT

Arizona is America's Egypt, but, unlike the land of the Pharoahs, whose secrets are revealed to us in hieroglyphics which our wise men have learned to read, the history of the ruined cities of our Southwest and the race that built them is yet unfathomed.

This is our land of mystery and enchantment, where nature has painted the landscapes with the rainbow's hues. It is the land of the painted desert, with its inspiring scenery and colors; it is the land of the Grand Canyon, Nature's architectural masterpiece, the Titan of chasms; the land of the meteoric mountain and the petrified forests. With resources of soil, minerals, and forests as varied as the wonderful colors of the landscape; with every gradation of climate from north temperate to semitropic; with an area double that of New England and a population less than that of the city of Washington, Arizona is yet practically undeveloped and almost unexplored.

Over its vast expanses of divinely tinted desert wander the Bedouins of the United States. Here and there on the higher mesas, or beside the deeply eroded waterways, dwell the strangest people on our continent.

This land of mystic dreams, of lost races and crumbling ruins, is awakening to the touch of modern civilization. The streams that once swept on unchecked through gorge and canyon are now being spread upon a thirsty land, and emerald-tinted oases are dotting landscapes which for ages were barren and desolate.

After the long and dusty ride across Arizona the traveler who awakes in Phœnix in the early morning feels transported into a new world. He is in a land where vegetation is almost tropic in its splendor and luxuriance. Here are avenues of palms whose spreading branches bend in graceful curves. Here the orange, the lemon, the olive, and the pomelo attain perfection in color and flavor. The date palm, laden with luscious fruit, the bread of the desert; the delicious fig, the almond, and countless other donations of generous nature are seen on every hand. Broad fields of alfalfa, yielding eight tons to the acre; bumper yields of grain, veg-

etables, and small fruit reward the man with the hoe in this land of sunshine and plenty. The soil's response to tillage and moisture is immediate—yea, almost miraculous.

But earth grants no harvest here without labor and expense. The desert, vast and forbidding, is near and threatening. Its threat of desolation is vitalizing; it energizes the man who engages in the combat. It thrusts its boundaries to the very edge of the irrigation canal which embraces the oasis. More than once in early days, when the river failed, the desert swept across the ditch and engulfed the fields and orchards. Such disasters emphasized the need for an assured water supply and led to the initiation of one of the most stupendous irrigation projects of our time in Salt River Valley.

THE MOST DIFFICULT OF ALL PROJECTS

In the variety of the engineering problems, in the magnitude of the works, and in the extraordinary character and number of difficulties surmounted in prosecuting the work, the Salt River project ranks first among the works of the Reclamation Service.

A few of these difficulties are made manifest by an inspection of the country in which the work is going on. The Salt River for a number of years furnished an inadequate supply of water for the needs of the farmers. At times great floods destroyed important headworks and caused heavy losses until the necessary repairs could not be made for lack of money. Near the headwaters, in an almost inaccessible mountain region, was one of the best natural reservoir sites in the West. To develop it involved an expenditure so vast that it was beyond the means of the community to attempt it. Congress enacted the Reclamation Law and the Reclamation Service took up the great work.

For 20 miles across a desert of cacti and mesquite, an absolutely waterless plain, a broad highway was laid out to the foot of the mountains. For 40 miles further into the most rugged mountain country in the West the road was blasted from the rocks.

In scenic beauty and in artistic and changeful coloring no highway in the West compares with it. The mountains are inspiring and the rocks are clothed in richest colors. No language can describe the glories of the sunrise or sunset pictures on those crags and cliffs, or the witching beauty of the deep canyons veiled in purple shadows. It is a drive, once taken, never to be forgotten.

The entrance to the canyon which Salt River has cut through the mountains was selected as the site of a dam. This structure in many respects will be one of the great engineering works of the age. At its base it covers an acre of ground. It will rise 284 feet from foundation to parapet and on top it will be 1,080 feet in length. To erect such a structure in a region so remote from transportation involved many difficulties. It was necessary for the engineers to qualify in many capacities. The government developed its own power by constructing a power dam 19 miles up the river and turning the water into a canal which was lined for miles with cement. A drop of 220 feet above the big dam furnished 4,000 horse-power, which was utilized for many purposes.

The engineers operated a cement mill which has turned out to date more than 100,000 barrels of first-class cement. Saw-mills were set up in the national forest, 30 miles away, and several million feet of lumber were cut and hauled to the works. Two farms were cultivated to supply forage and provisions, hogs and beef. Water works and electric light plants were established. A city of 2,000 people sprang up in the valley—a town of transient renown, for it has already nearly disappeared. For laborers the government turned to the Indians living in the mountains. Though many of them were Apaches, they proved tractable and industrious, and it was largely by their labor that the remarkable highway was constructed. From the big dam and from drops in the canal 26,000 horse-power will be developed. A part of it will be transmitted to the Sacaton Indian reservation to pump water from wells upon 8,000 acres belonging to the Pima In-

dians—an act of justice long postponed, for the tribe was beggared by the robbery of their water supply by white men.

ORLAND PROJECT, CALIFORNIA

This project involves the reclamation of 12,000 acres of land lying about 90 miles north of Sacramento, in Glenn and Tehama counties. The only town within the territory to be irrigated is Orland, on the Southern Pacific Railroad. The lands are exceedingly fertile, and for many years have been cultivated and utilized for wheat growing. With irrigation and the prevailing climatic conditions, however, it has been demonstrated that the land is unequaled for the production of alfalfa, nuts, and both citrus and deciduous fruits. Preliminary work on this project is practically completed, and advertisement for bids for building the East Park dam and spillway will be made in the near future. Many of the farmers are pledged to dispose of their holdings in excess of 160 acres to those who wish to take them under the reclamation project.

GARDEN CITY PROJECT, KANSAS

This project consists of a pumping system for the recovery of underground waters, which are delivered into a conduit leading to an old distributing canal, known as the Farmers' Ditch. The plant consists of twenty-three pumping stations, each driven electrically from a central power station. There are 10,656 acres of irrigable land in the project, lying in the vicinity of Garden City, on the north side of Arkansas River, townships 22 to 24 south, ranges 32 to 35 west, sixth principal meridian, Finney County.

The lands are all in private ownership, but there are some excess holdings for sale. The soil is a rich prairie loam, capable of the highest cultivation, and well adapted to the raising of grain, sugar beets, cantaloupes, alfalfa, and other crops of the plains region. The average elevation of the area under this project is 2,925 feet above sea level, and the temperature ranges from 20° below to 105° above zero. The Atchison, Topeka, and Santa Fé Railway furnishes transportation for the products to the local markets and to Chicago and Kansas City. The water-right charge is $35 per acre of irrigable land, and the farmers are also required to pay an annual maintenance and operation fee, which at present amounts to $2.75 per acre.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING

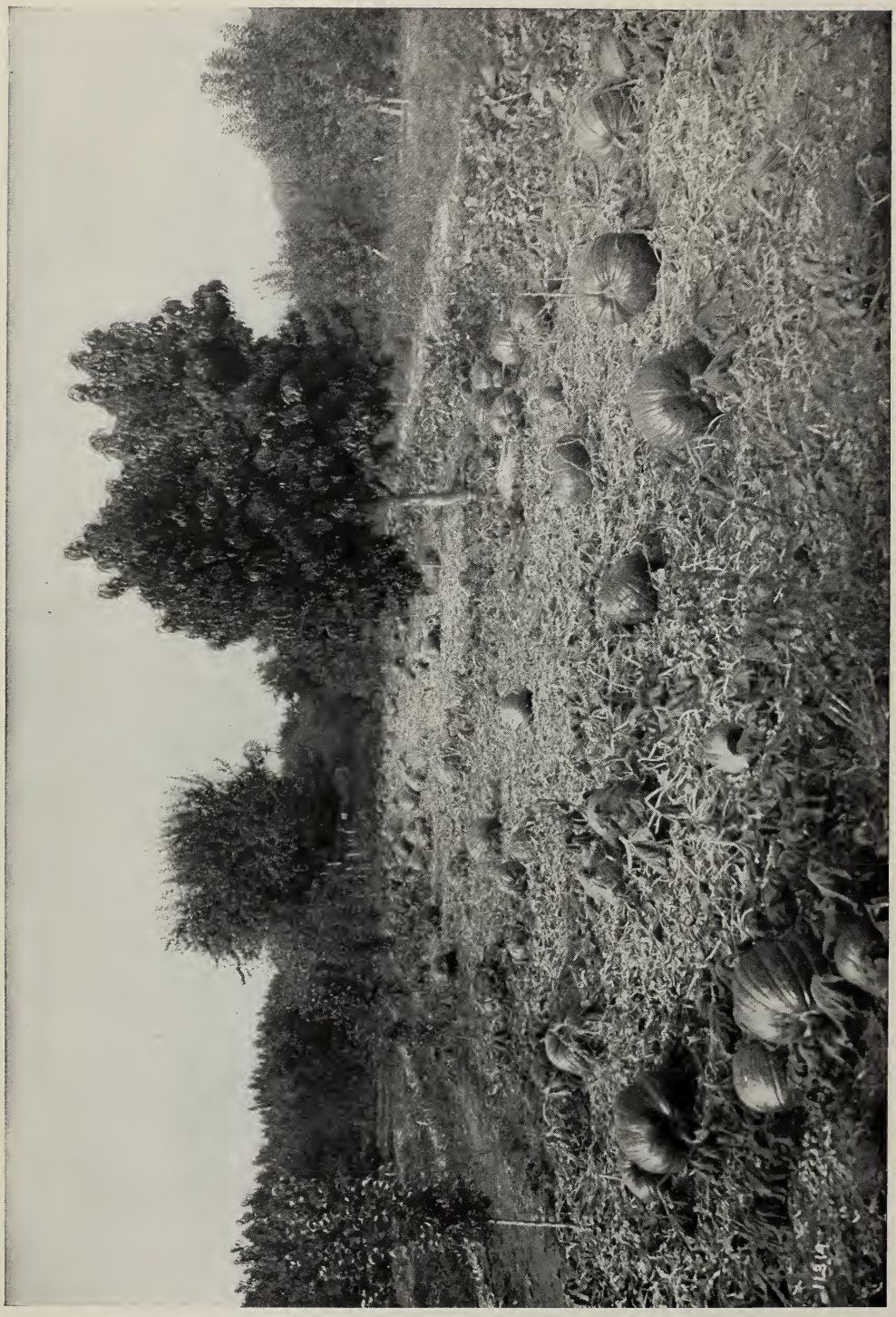
This project is located about 100 miles north of Cheyenne, Wyoming, and extends along the North Platte River. About 60,000 acres of land, practically all of which has been filed upon, will be supplied with water in 1909. The land is tributary to the Chicago and Northwestern, Burlington and Missouri River, and Union Pacific railroads. The average elevation is 4,100 feet above sea level, and the temperature ranges from 25° below to 100° above zero. The average annual rainfall on the irrigable area is about 15 inches.

The soil is a fertile, sandy loam, quite free from alkali, and requiring 2½ acre-feet of water per acre per annum. Alfalfa is the principal crop, but cereals, sugar beets, and potatoes are successfully grown. Excellent range country borders the irrigable lands in Wyoming.

The farm unit has been fixed at 80 acres, and the building charge is $45 per acre. There is also an annual charge for operation and maintenance, which is 40 cents per acre at present. The watershed area is 12,000 square miles, and the estimated annual run-off of watershed at Pathfinder dam is 1,500,000 acre-feet.

TRUCKEE-CARSON PROJECT, NEVADA

This project is located in western Nevada, in Churchill, Lyon, and Storey counties, townships 16 to 24 north, ranges 21 to 31 east, Mount Diablo meridian. The first unit of the project was opened in 1907, and lands are now subject to homestead entry. In addition to the land-office filing fee, each settler is required to pay $3 per acre annually for



PUMPKINS IN AN ORCHARD: YAKIMA PROJECT, WASHINGTON (SEE PAGE 416)

SCENE ON A TURKEY FARM ON THE GARDEN CITY PROJECT, KANSAS (SEE PAGE 427)

A MILLET FIELD ON THE TRUCKEE-CARSON PROJECT, IN NEVADA (SEE PAGE 431)

ten years, without interest on deferred payments. An annual maintenance fee is charged in addition. The first payment of $3.60 per acre must be paid at the time of filing on the land; the farm unit is 80 acres.

The climate in this valley is healthful and mild, the elevation above sealevel is about 4,000 feet, and the temperature ranges from 12° below to 112° above zero. It is so dry, however, that the extremes, which seldom occur, are not severe. The average rainfall on the irrigable area is 4 inches per annum. The soil is sandy loam, clay loam, and volcanic ash, requiring 3 acre-feet of water per annum for each acre. The valley will produce every variety of crop grown in the north temperate zone; alfalfa, wheat, barley, and oats grow luxuriantly, and corn is also a profitable crop. Apples, pears, peaches, apricots, cherries, potatoes, and garden vegetables do well and find a ready market in the near-by mining towns. The Southern Pacific and Nevada and California railroads traverse the tract and furnish transportation to the markets of the country.

RIO GRANDE PROJECT, NEW MEXICO-TEXAS

This project contemplates the reclamation of 180,000 acres of land, 110,000 of which are in New Mexico, 45,000 in Texas, and 25,000 in Mexico.

The Leasburg dam, for the first unit of the Rio Grande project, is completed, diverting water for 20,000 acres in Mesilla Valley. It is of concrete, 600-feet long, with sluice and head gates. From the diversion dam 6 miles of canal were constructed to connect with the old Las Cruces Canal.

The Engle dam, which is planned to be constructed across the Rio Grande opposite Engle, will be of rubble concrete, gravity type, 255 feet high, 1,150 feet long on top, and will create a reservoir 200 feet deep at its lower end and 45 miles long, with a storage capacity of 2,000,000 acre-feet. Work has commenced at the dam site and will be prosecuted as rapidly as the state of the reclamation fund will permit. The valley has good railroad facilities, and contains many thriving towns, of which El Paso, Texas, is the metropolis.

The general elevation is 3,850 feet above sea level, and the temperature ranges from zero to 110° above. The average annual rainfall on the irrigable area is 9.5 inches. The soil is a fertile alluvium, requiring 2½ acre-feet of water per acre per annum. It produces abundant crops when sufficient water is applied, the principal products being alfalfa, corn, fruit, vegetables, and melons.

CARLSBAD PROJECT, NEW MEXICO

The principal works under the Carlsbad project include the reconstruction of canals and storage reservoirs on Pecos River, in Eddy County, which were built to irrigate about 20,000 acres of land. These lands are all in private ownership, but several thousand acres are included in excess holdings and may be purchased. The price of these lands varies from $20 to $60 per acre. The cost of water right is $31 per acre, payable in ten annual installments, and the annual maintenance and operation fee is 75 cents per acre.

The general elevation is 3,100 feet above sea level, and the temperature ranges from zero to 110° above. The soil is a light, sandy alluvium and very fertile. The principal crops in the valley are peaches, pears, apples, cherries, small fruits, alfalfa, cotton, sweet potatoes, celery, and garden truck. Fodder, corn, cane, and milo maize produce good crops. Stock-raising is very profitable, owing to the extensive range lands on the east and west. The Santa Fé Railway furnishes transportation facilities to near-by markets and to Denver and Chicago.

The watershed area is 22,000 square miles, the average annual rainfall on watershed area is 15 inches, and the estimated annual run-off, 150,000 acre-feet. The average annual rainfall on the irrigable area is 14 inches. The system is practically completed.

SHEEP ON THE TRUCKEE-CARSON PROJECT OF NEVADA, WHERE WAS DESERT COUNTRY BEFORE THE GOVERNMENT ENGINEERS CAME
(SEE PAGE 427)

HONDO PROJECT, NEW MEXICO

The Hondo project provides for the diversion and storage of the flood waters from Hondo River, a tributary of the Pecos, to irrigate 10,000 acres of land in Chaves County, near Roswell. The lands are all in private ownership, but excess holdings may be purchased at reasonable prices. The general elevation is 3,900 feet above sea level, and the temperature ranges from 10° below to 100° above zero. The soil is a fertile alluvium and requires 2½ acre-feet of water per acre per annum. Alfalfa, corn, fruits, and vegetables produce abundantly when properly watered. The Santa Fé Railway furnishes transportation facilities. The building charge is $28 per acre.

The watershed area is 1,037 square miles, the average annual rainfall on watershed is 15 inches, and the estimated annual run-off is 40,000 acre-feet.

PUMPING PROJECTS, NORTH DAKOTA

The government has several pumping projects in western North Dakota for the purpose of raising water from the Missouri River to irrigate bench lands which cannot be reached by feasible gravity systems. Steam and electric power are used for pumping, the power being developed from lignite coal, which is found in ample quantities adjacent to the projects. Two of these systems are already in operation, the Williston and the Buford-Trenton.

Williston Project.—The initial unit of this project includes about 8,000 acres of bench and valley lands surrounding Williston, but the system will be enlarged to cover 12,000 acres. The general elevation is 1,900 feet above sea-level; the temperature ranges from 59° below to 107° above zero. The soil of the bottom lands is a heavy clay, with a considerable quantity of alkali. The bench lands, however, are a rich, sandy loam, requiring 2 acre-feet of water per acre per annum. The principal crops grown are wheat, flax, and oats. The supply of oats is always far short of the demand. Alfalfa is profitably grown for winter feed, and sugar beets are likely to become an important crop. Small fruits do well if protected from the winds, and dairy farms and market gardens are needed. The state experiment farm near Williston is of great assistance in demonstrating the value and methods of irrigation to the farmers.

The main line of the Great Northern Railroad passes through Williston, which is the distributing point for this section of the state.

The Buford-Trenton project embraces the bench and bottom lands bordering the north bank of the Missouri River for about 20 miles east of the Montana-North Dakota state line. Power for the pumps on this project is developed at the main power station at Williston, and is transmitted electrically over a transmission line 28 miles long.

The climate and crop conditions are practically the same as those at Williston, and the building, operation, and maintenance charges are the same as under that project. The project embraces about 12,500 acres of bench and bottom lands on the Great Northern Railroad. Practically all the land is in private ownership, but farmers owning more than 160 acres are required to sell their excess holdings, and farms can be bought at from $15 to $25 per acre.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

When completed this project will reclaim about 100,000 acres of land lying north and northeast of the Black Hills, in Butte and Meade counties, South Dakota. The greater part of this land has already been filed on. Water is now available for about 15,000 acres. There is a large amount of land in private ownership which, on account of the ruling limiting the individual water supply to 160 acres, is offered for sale at from $10 to $20 per acre, depending upon improvements and location. The farm unit on public lands is 40 and 80 acres. Settlers are required to pay a building charge of $30 per acre, and an annual fee of 40 cents per acre for operation and maintenance.

The average elevation is 2,800 feet above sea level. The climate is delightful, the temperature ranging from 25° below to 100° above zero. As in other parts of the arid region, the sensible temperature does not vary so much, owing to the dryness of the atmosphere. The soil is clay loam and sandy loam, exceedingly fertile and free from alkali. Fruits, such as apples, cherries, plums, and small fruits, do well, especially on the higher portions of the project near the bluffs, and potatoes can be raised on the south side of the river, where the soil is more sandy. The main crop, however, is alfalfa and native hay, which is in great demand for winter feed, the great number of cattle and sheep summer-pastured on the open range surrounding the project creating a constant demand for alfalfa. All the fruits and vegetables that can be raised on the project can be sold at the mining camps in the Black Hills. The Chicago and Northwestern Railroad passes through the town of Belle Fourche, which is one of the largest live-stock shipping points in the United States.

The engineering work on this project involves the construction of one of the largest earth embankments in the country, which is being built in a depression between two hills. It will be 115 feet high, 20 feet wide on top, and more than a mile long. The reservoir thus created will be filled with water by an inlet canal, which carries the entire flow of the Belle Fourche River.

STRAWBERRY VALLEY PROJECT, UTAH

This project provides for the irrigation of about 60,000 acres of land in Utah and Wasatch counties, on the eastern shore of Utah Lake. The water supply will be obtained from a storage reservoir that is being built in Strawberry Valley, about 30 miles east of the irrigable area. By means of a tunnel four miles long the stored waters will be carried through the mountains and emptied into Spanish Fork, from which a canal 18 to 20 miles long will convey them to the irrigable area. Power created from the high-line canal is now transmitted electrically to the tunnel for drilling and later will be utilized to pump water to lands above the gravity system.

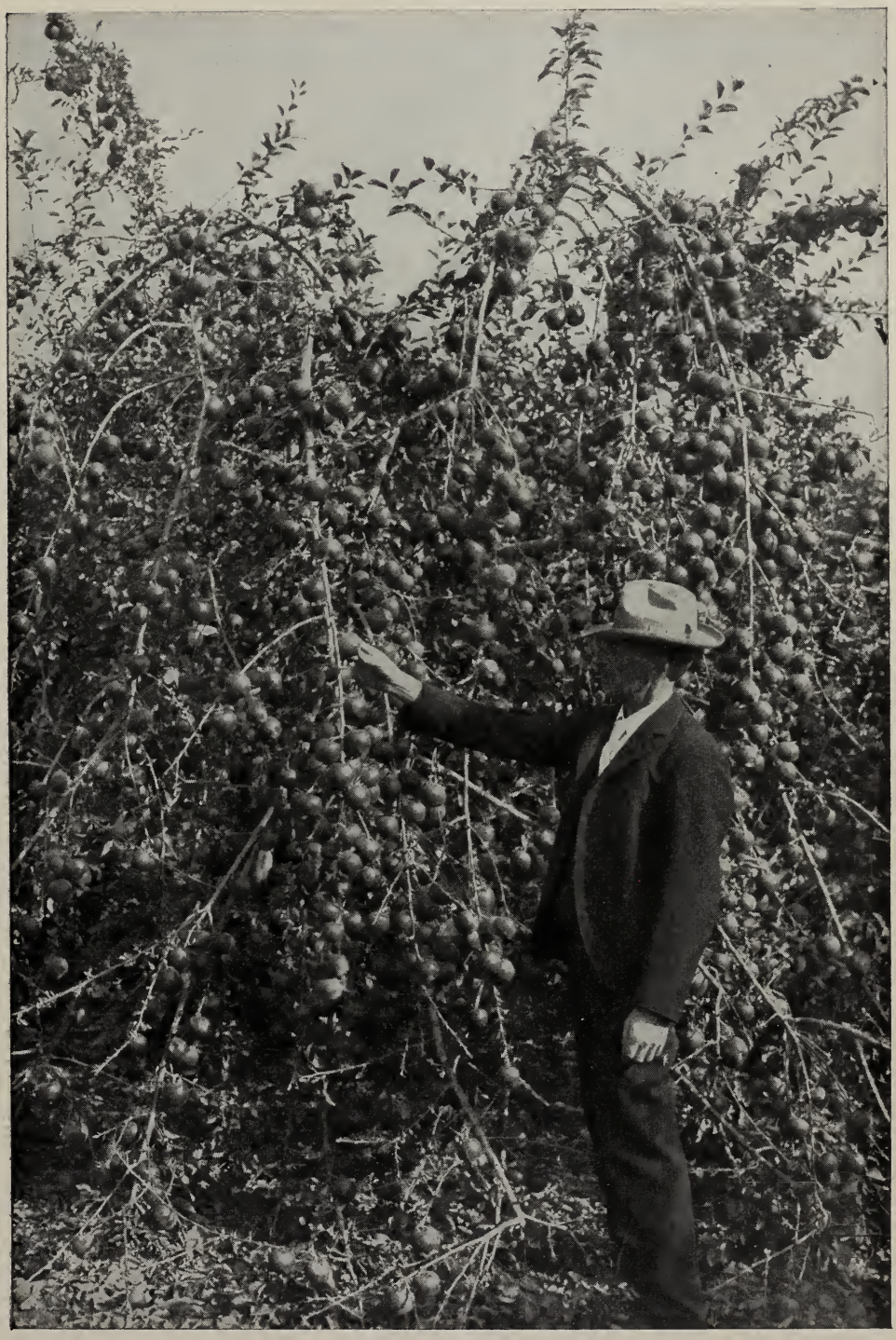
The lands have an elevation of about 4,500 feet, and the temperature ranges from 18° below to 99° above zero. The soil is a sandy loam and gravel, with a deep black soil in the bottom lands, and is exceedingly fertile. Alfalfa, hay, cereals, sugar beets, fruits, and vegetables are grown. Settlers are getting ready to plant orchards as soon as water is available. The lands are all in private ownership, and existing canals are being enlarged to form part of the government system. It is possible to purchase lands at reasonable prices from present owners.

The watershed area is 200 square miles, the annual rainfall on watershed 18 inches, and the estimated annual runoff 65,600 acre-feet. This valley has one of the finest domestic water supplies in the west, artesian water being found at many points.

THE DEMOCRACY OF THE DESERT

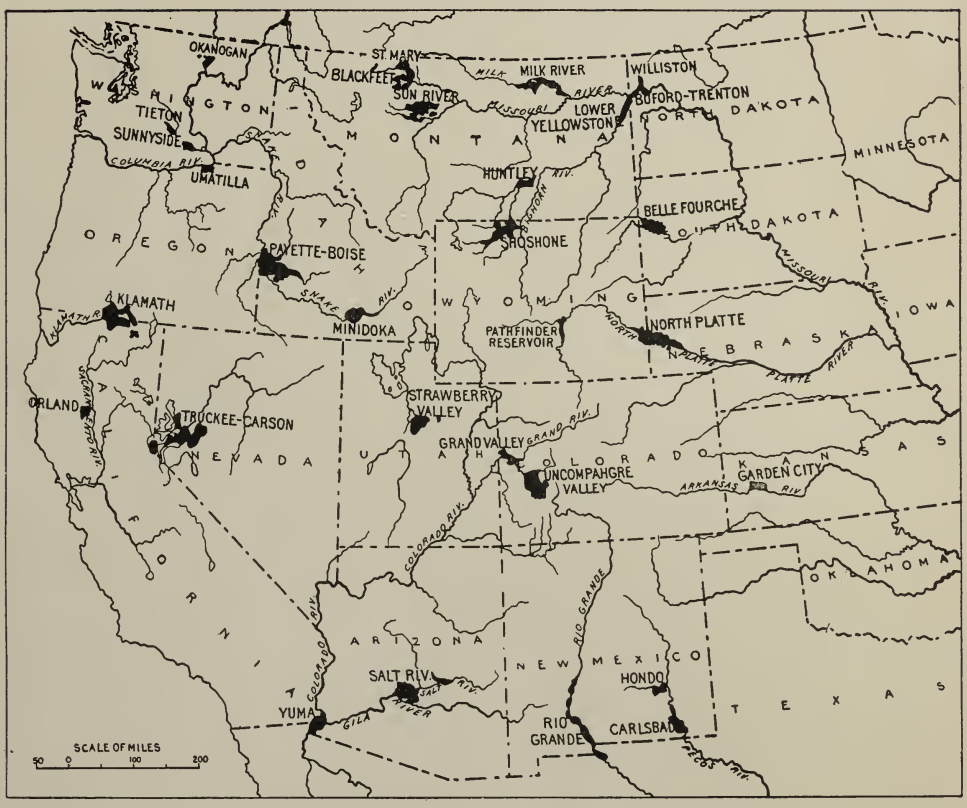
The democracy of the irrigated sections always impresses the newcomer. It is due to the small farm, the independence of the owners, and the social equality of the people. Conditions compel association and organization in harvesting and marketing high-priced products. The narrow provincialism which has marked life where farms are large is not found here. Rural delivery of mails, with daily papers, the county telephone, traveling libraries, centralized schools, and trolley lines to the towns are all serving to bring the desert farmer within the stimulating currents of the world's thought. One of the most prominent farm editors in America recently said to me: "In the irrigated West there will be developed in time the most nearly ideal conditions of rural life and the best types of men and women the world has ever seen."

A summation of the work of the Reclamation Service up to January 1, 1909, shows that it has built more than 3,458 miles of canals and ditches, some of



K. VAN DER AARDE AND ONE OF HIS WINESAP APPLE TREES: YAKIMA PROJECT, WASHINGTON (SEE PAGE 416)

SEEDLESS SULTANA GRAPES GROWN BY IRRIGATION NEAR CARLSBAD, NEW MEXICO
(SEE PAGE 431)



OUTLINE MAP SHOWING THE LOCATION OF THE GOVERNMENT RECLAMATION PROJECTS

which carry whole rivers. Laid end to end, these canals would reach from New York to San Francisco. It has in operation more than 983 miles of telephone lines. It has built 338 miles of roads, most of which are in a country heretofore inaccessible. The tunnels excavated have a total length of more than 16 miles. Nearly one million acres are now ready for irrigation, embracing 4,686 farms. The construction works completed include 793 bridges and 7,297 canal structures, such as dams, headgates, turnouts, drops, etc.

The excavations of rock and earth moved amount to the enormous total of 54,889,977 cubic yards. It is estimated that as a result of the activities of this bureau more than 20,000 people are now established in homes in the arid West.

3 0112 106068924